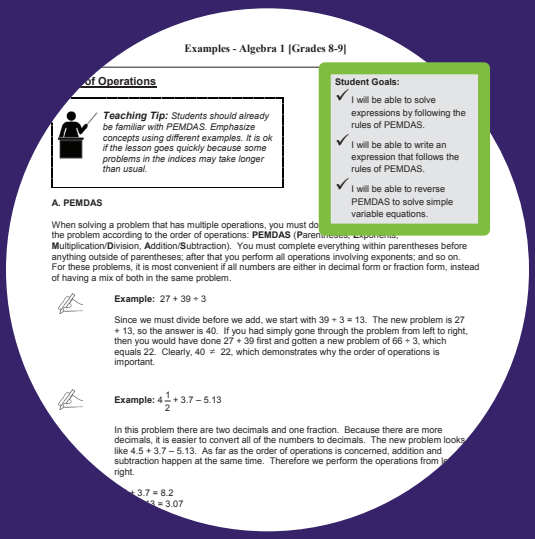
Algebra 1

Curriculum Sample

A Grade Ahead's rigorous, year-round math enrichment program is designed to challenge your child to a higher academic standard. Our monthly curriculum includes mathematical concepts that your child will see in school. Your child will learn and apply math concepts to real-world situations through word problems and develop strong critical thinking and analytical skills.

Each week will have an in-depth lesson (which we call Examples), homework, and answers. In these next pages, we offer a closer look at what our Examples, homework, and answers offer as well as a specific example of each.



Examples - Algebra 1 [Grades 8-9]

of Operations

Teaching Tip: Students should already be familiar with PEMDAS. Emphasize concepts using different examples. It is ok if the lesson goes quickly because some problems in the indices may take longer than usual.

Student Goals:

- ✓ I will be able to solve expressions by following the rules of PEMDAS.
- ✓ I will be able to write an expression that follows the rules of PEMDAS.
- ✓ I will be able to reverse PEMDAS to solve simple variable equations.

A. PEMDAS

When solving a problem that has multiple operations, you must do
the problem according to the order of operations: **PEMDAS** (Paren
Multiplication/**D**ivision, **A**ddition/**S**ubtraction). You must complete everything within parentheses before anything outside of parentheses; after that you perform all operations involving exponents; and so on. For these problems, it is most convenient if all numbers are either in decimal form or fraction form, instead of having a mix of both in the same problem.

Example: $27 + 39 \div 3$

Since we must divide before we add, we start with $39 \div 3 = 13$. The new problem is $27 + 13$, so the answer is 40. If you had simply gone through the problem from left to right, then you would have done $27 + 39$ first and gotten a new problem of $66 \div 3$, which equals 22. Clearly, $40 \neq 22$, which demonstrates why the order of operations is important.

Example: $4\frac{1}{2} + 3.7 - 5.13$

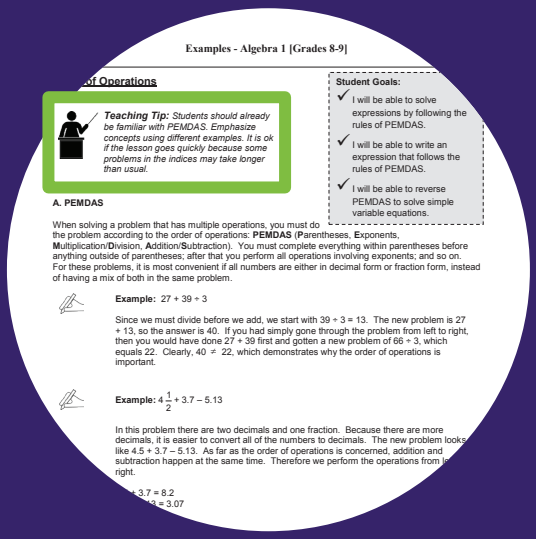
In this problem there are two decimals and one fraction. Because there are more decimals, it is easier to convert all of the numbers to decimals. The new problem looks like $4.5 + 3.7 - 5.13$. As far as the order of operations is concerned, addition and subtraction happen at the same time. Therefore we perform the operations from l
right.

$+ 3.7 = 8.2$
$3 = 3.07$

Student Goals

Student goals are listed at the top right of the Examples each week. These are topics that your child should understand by the end of the week.

Lesson pages are titled "Examples – Algebra 1 [Grades 8-9]," answer pages are titled Answers – "Algebra 1 [Grades 8-9]," and homework pages are simply titled "Algebra 1 [Grades 8-9]."



Examples - Algebra 1 [Grades 8-9]

...of Operations

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Example: 27 + 39 ÷ 3

Since we must divide before we add, we start with 39 ÷ 3 = 13. The new problem is 27 + 13, so the answer is 40. If you had simply gone through the problem from left to right, then you would have done 27 + 39 first and gotten a new problem of 66 ÷ 3, which equals 22. Clearly, 40 ≠ 22, which demonstrates why the order of operations is important.

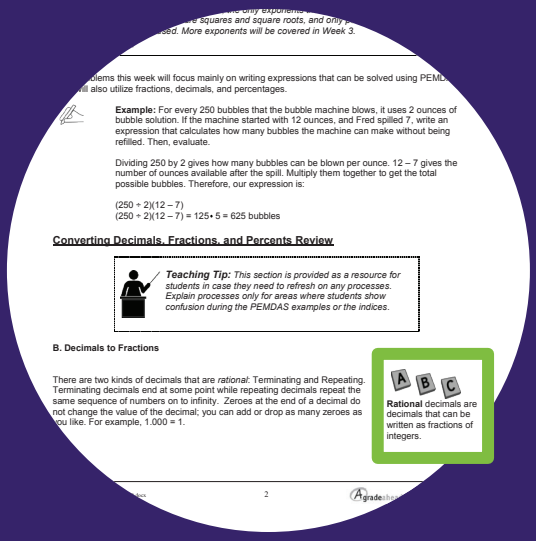
Example: $4\frac{1}{2} + 3.7 - 5.13$

In this problem there are two decimals and one fraction. Because there are more decimals, it is easier to convert all of the numbers to decimals. The new problem looks like 4.5 + 3.7 – 5.13. As far as the order of operations is concerned, addition and subtraction happen at the same time. Therefore we perform the operations from left to right.

...+ 3.7 = 8.2
...– 5.13 = 3.07

Teaching Tip

Teaching tips are suggestions to help you or your teacher present the topic to your child. These could include topics to review first or even an activity to do with your child.



...ed. More exponents will be covered in Week 3.

...blems this week will focus mainly on writing expressions that can be solved using PEMDAS. ...will also utilize fractions, decimals, and percentages.

Example: For every 250 bubbles that the bubble machine blows, it uses 2 ounces of bubble solution. If the machine started with 12 ounces, and Fred spilled 7, write an expression that calculates how many bubbles the machine can make without being refilled. Then, evaluate.

Dividing 250 by 2 gives how many bubbles can be blown per ounce. 12 – 7 gives the number of ounces available after the spill. Multiply them together to get the total possible bubbles. Therefore, our expression is:

(250 ÷ 2)(12 – 7)
(250 ÷ 2)(12 – 7) = 125• 5 = 625 bubbles

Converting Decimals, Fractions, and Percents Review

Teaching Tip: *This section is provided as a resource for students in case they need to refresh on any processes. Explain processes only for areas where students show confusion during the PEMDAS examples or the indices.*

B. Decimals to Fractions

There are two kinds of decimals that are *rational*. Terminating and Repeating. Terminating decimals end at some point while repeating decimals repeat the same sequence of numbers on to infinity. Zeroes at the end of a decimal do not change the value of the decimal; you can add or drop as many zeroes as you like. For example, 1.000 = 1.

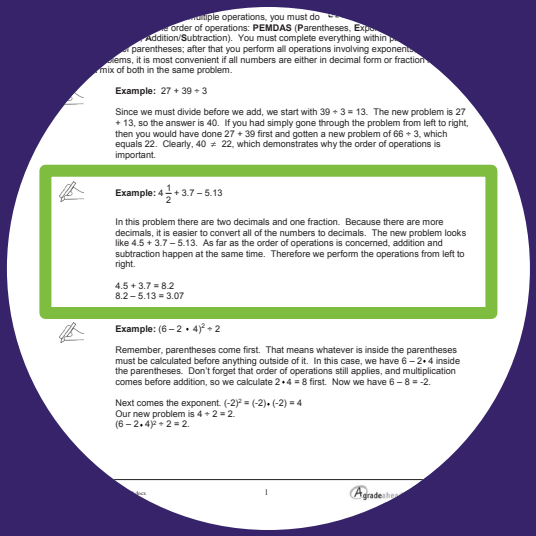
Rational decimals are decimals that can be written as fractions of integers.

2

ABC Word Boxes

These word boxes define terms used within the lesson that your child may not know.

Each day's homework usually takes about 30 minutes to complete.



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Example: $4\frac{1}{2} + 3.7 - 5.13$

In this problem there are two decimals and one fraction. Because there are more decimals, it is easier to convert all of the numbers to decimals. The new problem looks like 4.5 + 3.7 – 5.13. As far as the order of operations is concerned, addition and subtraction happen at the same time. Therefore we perform the operations from left to right.

4.5 + 3.7 = 8.2
8.2 – 5.13 = 3.07

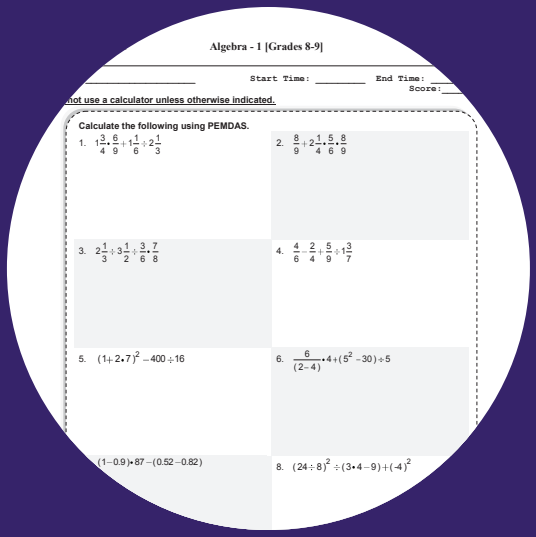
Example: $(6 - 2 \cdot 4)^2 \div 2$

Remember, parentheses come first. That means whatever is inside the parentheses must be calculated before anything outside of it. In this case, we have 6 – 2 • 4 inside the parentheses. Don't forget that order of operations still applies, and multiplication comes before addition, so we calculate 2 • 4 = 8 first. Now we have 6 – 8 = -2.

Next comes the exponent. $(-2)^2 = (-2) \cdot (-2) = 4$
Our new problem is 4 ÷ 2 = 2.
$(6 - 2 \cdot 4)^2 \div 2 = 2$.

Examples

To illustrate the topic, examples are provided to you and your child. These examples help demonstrate how to solve the problem or figure out the answer.



Algebra - 1 [Grades 8-9]

Start Time: _____ End Time: _____
Score: _____

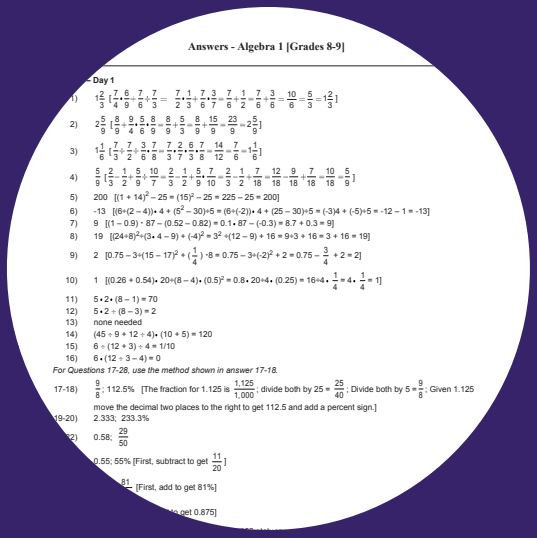
not use a calculator unless otherwise indicated.

Calculate the following using PEMDAS.

1. $1\frac{3}{4} \cdot \frac{6}{9} + 1\frac{1}{6} \div 2\frac{1}{3}$
2. $\frac{8}{9} \div 2\frac{1}{4} \cdot \frac{5}{6} \cdot \frac{8}{9}$
3. $2\frac{1}{3} \div 3\frac{1}{2} \div \frac{3}{6} \cdot \frac{7}{8}$
4. $\frac{4}{6} \cdot \frac{2}{4} \div \frac{5}{9} \div 1\frac{3}{7}$
5. $(1 + 2 \cdot 7)^2 - 400 \div 16$
6. $\frac{6}{(2-4)} \cdot 4 + (5^2 - 30) \div 5$
7. $(1 - 0.9) \cdot 87 - (0.52 - 0.82)$
8. $(24 \div 8)^2 \div (3 \cdot 4 - 9) + (-4)^2$

Homework

Each week, four days of homework are given to apply concepts from that week's lesson and reinforce the topic.



Answers - Algebra 1 [Grades 8-9]

– Day 1

1) $1\frac{2}{3}$ [$\frac{7}{4}\cdot\frac{6}{9}=\frac{7}{6}\div\frac{7}{3}=\frac{7}{2}\cdot\frac{1}{3}\div\frac{7}{6}\cdot\frac{3}{7}=\frac{7}{6}\div\frac{1}{2}=\frac{7}{6}\div\frac{3}{6}=\frac{10}{6}=\frac{5}{3}=1\frac{2}{3}$]

2) $2\frac{5}{9}$ [$\frac{8}{9}\div\frac{9}{4}\cdot\frac{5}{6}=\frac{8}{9}\div\frac{5}{3}=\frac{8}{9}\div\frac{15}{9}=\frac{23}{9}=2\frac{5}{9}$]

3) $1\frac{1}{6}$ [$\frac{7}{3}\div\frac{7}{2}\div\frac{3}{8}=\frac{7}{3}\cdot\frac{2}{7}\cdot\frac{8}{3}=\frac{14}{12}=\frac{7}{6}=1\frac{1}{6}$]

4) $\frac{5}{9}$ [$\frac{2}{3}\div\frac{1}{2}\div\frac{5}{9}\div\frac{10}{7}=\frac{2}{3}\div\frac{1}{2}\div\frac{5}{9}\cdot\frac{7}{10}=\frac{2}{3}\div\frac{1}{2}\div\frac{7}{18}=\frac{12}{18}\div\frac{9}{18}\div\frac{7}{18}=\frac{10}{18}=\frac{5}{9}$]

5) 200 [$(1+14)^2-25=(15)^2-25=225-25=200$]

6) -13 [$(6\div(2-4))\cdot4+(5^2-30)\div5=(6\div(-2))\cdot4+(25-30)\div5=(-3)4+(-5)\div5=-12-1=-13$]

7) 9 [$(1-0.9)\cdot87-(0.52-0.82)=0.1\cdot87-(-0.3)=8.7+0.3=9$]

8) 19 [$(24\div8)^2\div(3\cdot4-9)+(-4)^2=3^2\div(12-9)+16=9\div3+16=3+16=19$]

9) 2 [$0.75-3\div(15-17)^2+\left(\frac{1}{4}\right)\cdot8=0.75-3\div(-2)^2+2=0.75-\frac{3}{4}+2=2$]

10) 1 [$(0.26\div0.54)\cdot20\div(8-4)\cdot(0.5)^2=0.8\cdot20\div4\cdot(0.25)=16\div4\cdot\frac{1}{4}=4\cdot\frac{1}{4}=1$]

11) $5\cdot2\cdot(8-1)=70$

12) $5\cdot2\div(8-3)=2$

13) none needed

14) $(45\div9+12\div4)\cdot(10+5)=120$

15) $6\div(12+3)\div4=1/10$

16) $6\cdot(12\div3-4)=0$

For Questions 17-28, use the method shown in answer 17-18.

17-18) $\frac{9}{8}$; 112.5% [The fraction for 1.125 is $\frac{1,125}{1,000}$; divide both by 25 = $\frac{25}{40}$; Divide both by 5 = $\frac{9}{8}$; Given 1.125 move the decimal two places to the right to get 112.5 and add a percent sign.]

19-20) 2.333; 233.3%

22) 0.58; $\frac{29}{50}$

0.55; 55% [First, subtract to get $\frac{11}{20}$]

$\frac{81}{}$ [First, add to get 81%]

to get 0.875]

Answers

Answers are provided to check your child's homework. Enter the scores into the Parent Portal to track progress and note which areas may need more work.

Order of Operations

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Next comes the exponent. $(-2)^2 = (-2) \cdot (-2) = 4$
Our new problem is $4 \div 2 = 2$.
$(6 - 2 \cdot 4)^2 \div 2 = 2$.

Example: $\sqrt{54.36 - 18.36} \div 0.25$

Remember, square root comes first, so what is inside must be simplified so that the root can be found.

$54.36 - 18.36 = 36$

$\sqrt{36} = 6$

$6 \div 0.25 = 6 \div \frac{1}{4} = 6 \cdot 4 = 24$

Note: This week, the only exponents that students will be expected to use are squares and square roots, and only positive roots will be used. More exponents will be covered in Week 3.

Word problems this week will focus mainly on writing expressions that can be solved using PEMDAS. They will also utilize fractions, decimals, and percentages.

Example: For every 250 bubbles that the bubble machine blows, it uses 2 ounces of bubble solution. If the machine started with 12 ounces, and Fred spilled 7, write an expression that calculates how many bubbles the machine can make without being refilled. Then, evaluate.

Dividing 250 by 2 gives how many bubbles can be blown per ounce. 12 – 7 gives the number of ounces available after the spill. Multiply them together to get the total possible bubbles. Therefore, our expression is:

$(250 \div 2)(12 - 7)$

$(250 \div 2)(12 - 7) = 125 \cdot 5 = 625$ bubbles

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Rational decimals are decimals that can be written as fractions of integers.

To convert terminating decimals to fractions, imagine that the decimal is the numerator of a fraction whose denominator is 1. Multiply the top and bottom by a multiple of 10 that will eliminate the decimal point. Then, simplify.

Example: Turn 0.35 into a fraction.

0.35 has 2 decimal places, so remove the decimal and place 35 over 100.

$\frac{35}{100}$ can be simplified because both 35 and 100 can be divided by 5, which gives you $\frac{7}{20}$

Example: Convert 6.115 to a fraction.

6.115 has 3 decimal places, so remove the decimal and place 6115 over 1000.

$\frac{6115}{1000}$ has 6 thousands in it, so this can be written as a mixed fraction $6\frac{115}{1000}$

115 and 1000 are both divisible by 5, so the fraction reduces to $6\frac{23}{200}$

Note: Remember that the first place of a decimal is the tenths' place, the second is hundredths', and so on. This literally tells you what the denominator of the fraction will be. This system is helpful in converting fractions to decimals, as well.

C. Fractions to Decimals

To convert fractions to decimals, multiply the numerator and denominator by a number that makes the denominator a multiple of 10. Then, move the decimal point in the numerator to the left one place for each 0 after the 1.

Example: Convert $\frac{3}{60}$ into a decimal.

$\frac{3}{60} = \frac{1}{20}$ Reduce the fraction if possible.

$\frac{1 \cdot 5}{20 \cdot 5} = \frac{5}{100}$ If possible, multiply top and bottom to put the denominator 10, 100, etc.

$\frac{5}{100} = 0.05$ The 100 on the bottom means that the 5 goes in the hundredths' place. If it were a 15 in the numerator, the decimal would be 0.15

Sometimes it is not possible to find a convenient multiple of 10. In this case, one can always use long division.

Example: Convert $\frac{4}{7}$ to a decimal by dividing 4 by 7 and then rounding to 2 decimal places.

$$
\begin{array}{r}
0.571 \\
7\overline{)\,4.000} \\
\underline{-\,35} \\
50 \\
\underline{-\,49} \\
10 \\
\underline{-\,7} \\
3
\end{array}
\quad \text{(and so on)}
$$

$\frac{4}{7} \approx 0.57$

Note: Unless otherwise specified, round to 2 decimal places.

D. Percents (%)

Percent means "per one hundred." For example, 25 percent means 25 out of 100. 25 percent is written as 25%.

Usually, a percent is a part of a whole, "whole" being 100%. If you have driven 30% of a particular distance, then 70% or (100% – 30%) is left to drive. When you complete the drive, you have driven 100% of the distance.

E. Percents and Decimals

To convert a decimal to a percent, multiply the decimal by 100 and place a percent sign (%) after the number.

Example: 0.75 = 75 × 100% = 75%

To convert a percent to a decimal, do the opposite; remove the percent sign and move the decimal point two places to the left.

Example: 20% = 0.2

65% = 0.65

2% = 0.02

F. Percents and Fractions

In order to convert fractions to percents, the fraction should first be converted to a decimal. Then convert it from a decimal to a percent.

Example: $\frac{3}{4} = 0.75 = 75\%$

To convert a percent to a fraction, remove the percent sign and write the percent as a fraction over 100. Then, simplify.

Example: $20\% = \frac{20}{100} = \frac{1}{5}$

Example: $65\% = \frac{65}{100} = \frac{13}{20}$

Date: _____ Start Time: _____ End Time: _____

Score: ____/34

Do not use a calculator unless otherwise indicated.

Calculate the following using PEMDAS.

1. $1\frac{3}{4} \bullet \frac{6}{9} + 1\frac{1}{6} \div 2\frac{1}{3}$

2. $\frac{8}{9} + 2\frac{1}{4} \bullet \frac{5}{6} \bullet \frac{8}{9}$

3. $2\frac{1}{3} \div 3\frac{1}{2} \div \frac{3}{6} \bullet \frac{7}{8}$

4. $\frac{4}{6} - \frac{2}{4} + \frac{5}{9} \div 1\frac{3}{7}$

5. $(1 + 2 \bullet 7)^2 - 400 \div 16$

6. $\frac{6}{(2-4)} \bullet 4 + (5^2 - 30) \div 5$

7. $(1 - 0.9) \bullet 87 - (0.52 - 0.82)$

8. $(24 \div 8)^2 \div (3 \bullet 4 - 9) + (-4)^2$

9. $0.75 - 3 \div (15 - 17)^2 + \frac{1}{4} \bullet 8$

10. $(0.26 + 0.54) \bullet 20 \div (8 - 4) \bullet (0.5)^2$

Place the parentheses in the appropriate locations to evaluate the following. If no parentheses are needed, write "none needed."

11. $5 \cdot 2 \cdot 8 - 1 = 70$

12. $5 \cdot 2 \div 8 - 3 = 2$

13. $45 - 6 + 3 \cdot 32 \div 4 = 63$

14. $45 \div 9 + 12 \div 4 \cdot 10 + 5 = 120$

15. $6 \div 12 + 3 \div 4 = \frac{1}{10}$

16. $6 \cdot 12 \div 3 - 4 = 0$

Fill in the blank with the missing conversion (Decimal, Fraction, or Percentage). Round decimals to 3 places, where possible.

17-18. 1.125 = _____ = _____

19-20. _____ = $\frac{7}{3}$ = _____

21-22. _____ = _____ = 58%

23-24. _____ = $(\frac{12}{16} - \frac{1}{5})$ = _____

25-26. _____ = _____ = (73% + 8%)

27-28. (0.607 + 0.268) = _____ = _____

Word Problems

Make an expression. Then, evaluate. You may use a calculator.

29. At Angkor Wat in Cambodia, 13 temples have 15 statues each, 5 temples have 23 statues each, and 1 temple has 12 statues. How many statues are there in all?

_____

30. Freida is baking cookies. On each cookie sheet, there is room for 2 rows of 4 cookies each and one row of 3 cookies. Freida baked 5 sheets of cookies. How many cookies did she make?

_____

31. Eighty students go to lunch. $\frac{3}{10}$ of them get 2 containers of milk to drink; the rest of them get one container. How many containers of milk do they drink altogether?

_____

32. When Mireille mows one of her neighbor's lawn, they pay her $7.25. This week, she mowed 4 neighbors' lawns. One of them gave her a $3.50 tip. How much did Mireille earn this week from mowing lawns?

_____

Pat earned $480 last week. Ernie earned 15% more than Pat last week.

33. Write an expression that represents how much the two earned together.

_____

34. How much did the two earn last week?

_____

Week: 1 – Day 1

1) $1\frac{2}{3}$ $[\frac{7}{4}\bullet\frac{6}{9}+\frac{7}{6}\div\frac{7}{3}=\ \frac{7}{2}\bullet\frac{1}{3}+\frac{7}{6}\bullet\frac{3}{7}=\frac{7}{6}+\frac{1}{2}=\frac{7}{6}+\frac{3}{6}=\frac{10}{6}=\frac{5}{3}=1\frac{2}{3}]$

2) $2\frac{5}{9}$ $[\frac{8}{9}+\frac{9}{4}\bullet\frac{5}{6}\bullet\frac{8}{9}=\frac{8}{9}+\frac{5}{3}=\frac{8}{9}+\frac{15}{9}=\frac{23}{9}=2\frac{5}{9}]$

3) $1\frac{1}{6}$ $[\frac{7}{3}\div\frac{7}{2}\div\frac{3}{6}\bullet\frac{7}{8}=\frac{7}{3}\bullet\frac{2}{7}\bullet\frac{6}{3}\bullet\frac{7}{8}=\frac{14}{12}=\frac{7}{6}=1\frac{1}{6}]$

4) $\frac{5}{9}$ $[\frac{2}{3}-\frac{1}{2}+\frac{5}{9}\div\frac{10}{7}=\frac{2}{3}-\frac{1}{2}+\frac{5}{9}\bullet\frac{7}{10}=\frac{2}{3}-\frac{1}{2}+\frac{7}{18}=\frac{12}{18}-\frac{9}{18}+\frac{7}{18}=\frac{10}{18}=\frac{5}{9}]$

5) 200 $[(1 + 14)^2 – 25 = (15)^2 – 25 = 225 – 25 = 200]$

6) -13 $[(6\div(2 – 4))\bullet 4 + (5^2 – 30)\div5 = (6\div(-2))\bullet 4 + (25 – 30)\div5 = (-3)4 + (-5)\div5 = -12 – 1 = -13]$

7) 9 $[(1 – 0.9)\cdot 87 – (0.52 – 0.82) = 0.1\bullet 87 – (-0.3) = 8.7 + 0.3 = 9]$

8) 19 $[(24\div8)^2\div(3\bullet 4 – 9) + (-4)^2 = 3^2 \div(12 – 9) + 16 = 9\div3 + 16 = 3 + 16 = 19]$

9) 2 $[0.75 – 3\div(15 – 17)^2 + (\frac{1}{4})\cdot8 = 0.75 – 3\div(-2)^2 + 2 = 0.75 – \frac{3}{4} + 2 = 2]$

10) 1 $[(0.26 + 0.54)\bullet 20\div(8 – 4)\bullet(0.5)^2 = 0.8\bullet 20\div4\bullet(0.25) = 16\div4\bullet\frac{1}{4} = 4\bullet\frac{1}{4} = 1]$

11) $5\bullet 2\bullet(8 – 1) = 70$

12) $5\bullet 2\div(8 – 3) = 2$

13) none needed

14) $(45\div9 + 12\div4)\bullet(10 + 5) = 120$

15) $6\div(12 + 3)\div4 = 1/10$

16) $6\bullet(12\div3 – 4) = 0$

For Questions 17-28, use the method shown in answer 17-18.

17-18) $\frac{9}{8}$; 112.5% [The fraction for 1.125 is $\frac{1{,}125}{1{,}000}$; divide both by 25 = $\frac{25}{40}$; Divide both by 5 = $\frac{9}{8}$; Given 1.125 move the decimal two places to the right to get 112.5 and add a percent sign.]

19-20) 2.333; 233.3%

21-22) 0.58; $\frac{29}{50}$

23-24) 0.55; 55% [First, subtract to get $\frac{11}{20}$]

25-26) 0.81; $\frac{81}{100}$ [First, add to get 81%]

27-28) $\frac{7}{8}$; 87.5% [First, add to get 0.875]

29) $13\bullet15 + 5\bullet23 + 12 = 195 + 115 + 12 = 322$ statues

30) $5(2\bullet4 + 3) = 5(8 + 3) = 5(11) = 55$ cookies

31) $2(\frac{3}{10})(80) + 1(\frac{7}{10})(80) = 2(24) + 1(56) = 48 + 56 = 104$ containers of milk

32) $(4\bullet7.25) + 3.5 = 29 + 3.5 = \$32.50$

33) $480 + 480(1.15)$

34) \$1,032